experienced at present on Arctic and Antarctic regions. The cold, although it might to some extent diminish the snowfall, would dry the air and prevent the temperature of the snow rising to the melting-point. It would not prevent evaporation taking place over the ocean by the sun's heat, but the reverse, but it would prevent the melting of the snow on the land during the greater part of the year.

In places like Fuego and S. Georgia, where the snow-fall is considerable, perennial snow and ice are produced by diametrically opposite means, as I have elsewhere shown, viz., by the sun's heat being cut off by clouds and dense fogs. In the first place the upper surface of the clouds act as reflectors, throwing back the sun's rays into stellar space; and in the second place, of the heat which the clouds and fogs absorb, more than one-half is not radiated downwards on the snow, but upwards into space. And the comparatively small portion of heat which manages to reach the ground and be available in melting the snow is insufficient to clear off the winter's accumulation.

JAMES CROLL

Artificial Diamonds

ON reading Mr. Hannay's communication to the Royal Society on the production artificially of crystallised carbon or diamond (*Proc.* Roy. Soc., vol. xxx., No. 204, May, 1880), in the course of which Mr. Hannay states that he has made eighty experiments, only three of which have been successful. In almost every case his iron or steel vessels, enormously thick in proportion to their small bore, have burst at a red heat or above it, by the pressure of the included hydrocarbon vapour.

Will Mr. Hannay permit me to suggest to him that if, instead of an enormously thick and difficult to weld up tube, he will inclose his materials in a comparatively thin one and then inclose that in another like tube shrunk on or contracted over the former, and so on to a third, or, if necessary, fourth tube, each possessing an initial tension upon those within it, he may thus obtain compound tubes either of wrought iron or steel easily welded staunch, and capable of withstanding any assignable amount of internal elastic pressure. This is the principle upon which, since 1855, all rifled artillery is constructed.

The Grove, Clapham Road, June 22 R. MALLET

A Fourth State of Matter

IN Mr. Crookes' communication on this subject (NATURE, vol. xxii. p. 153) occurs the sentence, "An isolated molecule is an inconceivable entity." This proposition would appear to me to be questionable. For if we cannot conceive an isolated molecule, how are we to conceive of two (or more) molecules, *i.e.*, conceive of matter at all? For the conception of two molecules involves the isolation of each in the mind, otherwise surely the two would be mentally blended into one. It is further said of a molecule, "Solid it cannot be." May not the external qualities ordinarily attributed to a "solid" be said to be those of a body possessing a certain amount of rigidity (*i.e.*, whose parts resist displacement) combined with a certain elasticity? Would not these be substantially the properties of a single vortex molecule, according to those who have investigated this subject? For it appears that such a molecule would be (perfectly) elastic, and inseparable into parts. At the same time it would seem that there would be nothing to prevent it from being harder or more rigid than any large scale solid (built up of such molecules?) with which we are acquainted.

"A fourth state of matter," as it appears to me, is a distinction which has something arbitrary about it. If (for instance) the æther be a gas, the mean length of path of whose minute molecules is not less than planetary distances—a proposition which it might not be easy to disprove directly—then this would be a mean path indefinitely greater than that of the molecules of the most rarefied gas. Would it, however, be legitimate to regard the æther (under this condition) as matter in "a fourth state"? This would seem, in my judgment at least, only to complicate the subject unnecessarily. For after all we are concerned in such cases with the mere quantitative difference of length of path. S. TOLVER PRESTON

London, June 28

Auroral Observations

IN order to get nearer, if possible, to the unravelling of the mysteries of the aurora borealis, I have in the course of the last two years endeavoured to procure a great number of observations of this phenomenon in Norway, Sweden, and Denmark. I have succeeded in engaging throughout the above-named countries several hundreds of observers, who, led only by scientific interest, have lent me their assistance, and from whom I have already received a considerable amount of information. These observations are to be continued, as there is reason to suppose that the aurora borealis in the near future will appear much more frequently than has been the case during the last years. Finland and Iceland will also now be drawn within the circle, and *it would be most desirable that similar observations were made also in Great Britain*, which country—especially in the maximum years of the appearance of the aurora borealis—certainly would yield characteristic contributions in this respect. I therefore take the liberty to invite friends of science to make such observations in accordance with the system which I have introduced in Scandinavia; a schedule for recording observations, along with the necessary instructions, will be sent to any one who, before the end of August, informs me of his name and address.

SOPHUS TROMHOLT

Bergen, Norway, June Professor of Mathematics

Other papers in Great Britain are requested kindly to give the above appeal a place in their columns.

The Hydrographic Department

AS you have been misinformed on several points respecting my connection with the Hydrographic Department, I request, both on public grounds and in ordinary fairness to myself, that you will insert the following corrections of statements in your article on this subject in NATURE, vol. xxii. p. 86.

My work on the Norwegian coast has not been "dignified into a hydrographical survey." That work, combined with my knowledge of the Norwegian language, charts, and pilotage, satisfied the hydrographer that I was competent to compile a "Norway Pilot." It is incorrect to represent that I have ever laid claim to anything more than that.

I have not made a "rude" or "ungenerous" attack on the Hydrographic Department. I have temperately stated facts which cannot be disproved, in the interests of hydrography, and to show the necessity for giving increased strength and efficiency to the department. It is no answer to these facts to disparage my own efforts in the cause, or to call me a small and obscure clique actuated by personal motives. The clique to which I belong is small indeed, for it consists only of myself. It may also be obscure, but it is untrue that I am influenced, in anything I may do, by other than public motives and a desire to further the interests of commerce and of hydrography.

The gravest error into which your informant has led you is the statement that the Hydrographic Department had confided to me, "mistakenly" or otherwise, the "*revision* of the sailing directions" for part of Norway. I *compiled* those sailing directions, as expressly stated in the official printed "Advertisement," signed by the hydrographer himself, and the department has done exactly the opposite of what your informant states; it has refused to allow me to *revise* my own work, and has consequently published an erroneous light list, which will be followed by an incomplete "Pilot." Against this procedure it is my obvious duty to protest. I am also bound to warn all those whom it may concern of the errors to which the department has deliberately given dangerous publicity.

The paper read before the Society of Arts brought the dangers along the trade route between England and Siberia to public notice in some detail, and contained other facts relating to neglected surveys and to charts compiled from antique and inadequate data, which it was right that merchants and seamen should be aware of. If my statements are accurate—and I challenge your informant to disprove any one of them—then the Society of Arts did useful service in accepting my paper. No good end can be gained by calling me names and accusing me of personal motives. Let my statements be disproved if your informant is able to disprove them. If he cannot do so, then those statements are incontrovertible witnesses to the fact that the Hydrographic Department is unequal to the demands upon it. Unsupported assertions that the department stands "well, and deservedly so, in the estimation of scientific circles," are of no weight when opposed to facts, which your informant cannot disprove, and apparently dares not face. GEORGE T. TEMPLE

The Nash, near Worcester, June 2

[WE have given publicity to Lieut. Temple's reply to the

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notice on the Hydrographic Department which appeared in NATURE, vol. xxii. p. 86, on the grounds advanced by him in the first paragraph of his letter.

Our readers will scarcely receive Lieut. Temple's statement that that department has deliberately given dangerous publicity to errors. This would be contrary to the traditions, and certainly to the interests, of any public office connected with the practical and working world. But however this may be, is not the Hydrographic Department pursuing a prudent course in causing a revision to be made of Lieut. Temple's compilation by another authority? In the interests of navigation we think it is; for on a great stretch of coast like Norway, which, from its sinuous and broken character, can be reckoned by thousands of miles of sea-board, it is clearly unadvisable that dependence should be entirely placed on the efforts of one individual.

We are the more confirmed in this belief from a significant letter which lately appeared in the *Shipping and Mercantile Gazette* and in the *Daily News* from the Royal Norwegian Geographical Survey Office, dated Christiania, the 16th inst., written, as the writer alleges, "in order to correct the erroneous statements contained in Mr. Temple's paper (read at the Society of Arts) respecting the charts and descriptions of the Norwegian coast now existing."—ED.]

Curious Electric Phenomenon

AT about 4.30 p.m. this day a severe thunderstorm with a deluge of rain came up from the north-west and lasted about an hour. At 5.30 my wife was standing at the window watching the receding storm, which still raged in the south, just over Leicester, when she observed, immediately after a double flash of lightning, what seemed like a falling star, or a fireball from a rocket, drop out of the black cloud about 25° above the horizon, and descend perpendicularly till lost behind a belt of trees. The same phenomenon was repeated at least a dozen times in about fifteen minutes, the lightning flashes following each other very rapidly and the thunder consisting of short and sharp reports. After nearly every flash a fireball descended. These balls appeared to be about one-fifth or one-sixth the diameter of the full moon, blunt and rounded at the bottom, drawn out into a tail above, and leaving a train of light behind them. Their colour was mostly whitish, but one was distinctly pink, and the course of one was sharply zig-zagged. They fell at a rate certainly not greater than that of an ordinary shooting star. I have never witnessed a phenomenon of this kind myself, but my wife is a good observer, and I can vouch for the trustworthiness of her report.

F. T. MOTT

Birstal Hill, near Leicester, June 22

Meteor

ON Friday, June 11, at 8.5 p.m., while the sun was still shining, I saw due east as near as I could judge, and about 30° above the horizon, a bright white meteor pass across about 10° or 12° from right to left with a slight downward course. Two or three hours later I saw a small one take a parallel course, but the other side the zenith.

W. ODELL

Coventry, June 14

Minerva Ornaments

DURING a recent visit to England I spent a considerable time in the Museum at South Kensington, and Dr. Schliemann's collection of antiquities was one of the objects in that museum which I was most desirous to see.

I should like to call attention to one point in regard to this collection of relics. Among others I saw a number of flat rounded pebbles, which, by chipping at the middle on both edges, have been brought into something like the shape of an hour-glass. These are marked "Minerva Ornaments." There are several other relics, the titles on which seemed to me to be, speaking within bounds, somewhat imaginative; such, for example, as the small pieces of gold plate on the *πλεκτὴ ἀναδέσμη*, or headdress, where Dr. Schliemann sees the owl's head and two large eyes, "which cannot be mistaken"; but to name these flat pebbles "Minerva Ornaments" seems to trespass not a little beyond the due limits of the imagination when applied to science.

Stones of precisely the same shape and size, and cut in the same way, are common in this country, where Minerva was "an unknown goddess" before the arrival of the Christians. They are picked up on the banks of the rivers, and when placed in collections are ticketed "net-sinkers." I cannot doubt that Dr. Schliemann's "Minerva Ornaments" are *only* Trojan net-sinkers formed as those of the aboriginal inhabitants of this country, because the savage mind seems to have run in the same channel all over the world.

E. W. CLAYPOLE

Antioch College, Ohio

A Snake in Kensington Gardens

I WAS considerably surprised this evening at finding the lifeless body of a snake about one hundred yards to the south-east of Kensington Palace. A policeman informed me that he had killed it there last Thursday as it was rapidly moving over the ground. The head and neck had been utterly destroyed, most likely by stampings of the policeman's foot, but the remainder of the body was perfect. In length it was about twenty inches, the body, from the thickness of a little finger, gently tapering to a tail ending in a fine point. Regular scales, brownish-black in colour, clothed the back, the scales along the sides being yellowish-green. A distinct fringe, or prolonged fin, stiffly standing erect of about one-quarter of an inch in height, ran down the centre of the back, in colour the same as the rest of the body in that region. I trust this description may enable some of your readers learned in snakes to identify the species. Then I would ask, Is this animal a native of these parts, or had it been introduced, or had this specimen most likely escaped from captivity to meet with its untimely end?

J. HARRIS STONE

11, Sheffield Gardens, Kensington, W.

THREE YEARS' EXPERIMENTING IN MENSURATIONAL SPECTROSCOPY

BY A NEW HAND THEREAT

IT was in 1876 that the experimenter,[1] of whom the following notes have been requested, clearly perceiving that it would not do any longer, even in his private work, to be content with merely a little direct-vision, ready-made, purchased, spectroscope and the few scale points offered by reference to lamp-flame lines—set about making up a tolerably large spectroscopic instrument to satisfy his own ideas, wants, and aims.

Now the leading desire with him herein, was, in suitable return for H.M. Government having then recently changed the locality of his official residence from a low, sunk position, where and whence little but other houses could be seen, to an elevated site half-way up the northern side of the Calton Hill, commanding an excellent view of the northern, north-eastern, and north-western horizons, together with the best and brightest parts of almost *all* auroral displays, whenever they occurred—it was his desire, as a decorous and appropriate tribute, to render some respectable spectroscopic account (over and above anything that the Royal Observatory, Edinburgh, and its more purely astronomical instruments could do) of those sometimes nocturnally luminous, but generally fitful, evanescent, and not yet fully explained, phenomena of the skies, the *Auroræ Polares*.

To this end the nascent spectroscope, mounted before a window in an upper chamber, assumed the form of a large flat telescopic box, almost five feet long, two broad, half a foot deep, supported on a stout alt-azimuth stand, with powerful screw motions. The box carried a gathering telescope in front, whose objective, as well as those of the internal collimator and inspecting telescope, were, like those of a "night-glass," large, *i.e.*, 2·2 inches in diameter; and short, *i.e.*, 17 inches, in focal length. An extensive and easily read scale for any prism's minimum deviation positions, and a long, but very easily worked, micrometer-screw motion for the telescope eye-piece were supplied, also an illuminated pointer. An electric reference spectrum of hydrogen lines above and below the fiducial central zone of the field of view was caused to be ever

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[1] Prof. Piazzi Smyth, Astronomer-Royal for Scotland.

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